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IDENTIFICATION OF PROBLEMS OF A VILLAGE IN HARYANA USING PARTICIPATORY AGRO-ECOSYSTEM ANALYSIS

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ABSTRACT

Participatory Rural Appraisal (PRA) tools were implemented and the data was analyzed for getting into in-depth analysis of the major problems of a village Nikhri in Haryana. The PRA tools helped to make in depth participatory analysis for bringing out new emerging issues of conducting further investigations and make recommendations to solve the problem identified. The interdisciplinary team of the scientist for Field Experience Training (FET) has suggested an action plan entitled 'Productivity enhancement through pest management in Nikhri village: An Integrated Approach' based on the study undertaken.

KEYWORDS: PRA, Field Experience Training, Interdisciplinary Project

INTRODUCTION

Agriculture is the backbone of Indian economy. Past few decades in particular has witnessed a significant change in Indian agriculture with food grain production increased multifold since independence. Similar spurt was witnessed in vegetable, milk and fish production. Revolutionary changes are taking place in biotechnology, informatics-paving way for major advances in farm front.

However the farm sector is besieged with many problems, which need immediate attention like achieving sustainability, cater to the food and nutritional requirements of burgeoning population, dealing with labour mobility towards urban chores. There is a need to understand the structure and cause of these problems and make concerted efforts to make agriculture sector truly a profitable proposition. This calls for the scientists to interact with the farmers and understand their requirements to formulate a solution to their grievances. Participatory Rural Appraisal (PRA) can be used as an effective tool to find location specific problem and evolve researchable issues with possible solutions for short term and long-term benefits. It is a good exposure for the trainee scientists to get first hand feel of the problems of the farmers. This facilitates the scientists to make farmer understand his need and express his constraints and problems on a broader canvas so that the trainee scientist can use his intuitive skills to understand his role in addressing the farmer's problems.

PRA is an exercise that deals with temporal, spatial and human issues in agricultural activities. Spatial information elicits information on soil type, water resources, land use, land pattern and topography of different life support systems. Temporal data helps in seasonal analysis, adoption and awareness about the new technologies. The human dimension helps in knowing the facts about participation, gender issues, desegregation, cultural values and ethics of the people of those localities.

PRA is also an exercise towards understanding the agricultural practices of the farmer some of which may be over adopted, discontinued or rejected. It enables to find out the reasons for adoption/non adoption of technology and highlights

the missing links in research priorities, if any. Here comes the role of researchers to know 'what exactly farmers want'. The needs of the farmers or end-user of a technology can be better understood through an approach called Participatory Rural Appraisal (PRA) or PLM (Participatory learning method). It is a 'bottom up', 'farmer participatory', multi-disciplinary and holistic approach.

The opportunity for learning interdisciplinary research must be developed to create interactive and interdisciplinary research. In this context National Academy of Agricultural Research Management, Hyderabad (NAARM) trains young scientist recruits through a training programme called Foundation Course for Agricultural Research Service (FOCARS). FET is an inbuilt programme, where young scientists work in village and learn PRA methods. These scientists are already exposed to PRA techniques through classroom teaching and work exercises in village they facilitate the process of appraisal, farmers do the appraisal themselves in the form of self drawn pictures and diagrams (Mettrick and Wessel, 1986, Conway, 1987). The overall objective of the FET programme is to provide the ARS probationers an opportunity to gain firsthand experience and insight into agriculture and rural development scenario in general and the problems of the farming community in particular. The specific objectives of the FET are:

- Providing an opportunity to the trainee scientists for interaction with the farming community including the stakeholders and to get an insight into their ways of living, needs, resources, priorities, problems and prospects.
- Enabling the trainee scientists to understand the adoption profile of farming community, the technology adoption and diffusion process, and the factors associated with adoption and related concepts.
- Providing an opportunity to the trainee scientists to understand the extension system, transfer of technology operating in the village, credit financing and stakeholder's role.
- Providing an opportunity to the trainee scientists to gain an insight and appreciation about Indigenous Technical Knowledge (ITK) of farmers and to generate appropriate technologies if scientifically valid.
- Enabling the trainee scientists to discuss the problem and identify field related problems related to agriculture, which in turn will provide way for the scientist to identify his/her role as a scientist in ranking to most researchable problem.
- Inculcating the spirit of teamwork in an inter/multi disciplinary context.

The present study was conducted, during 78th FOCARS training program, in a village called 'Nikhri' situated in Rewari district of Haryana, India. The system tools and methods were used for identifying indigenous natural, resource types, relationships and key decision-making systems in the village.

As a part of 78thFOCARS training program offered at NAARM, Hyderabad, a part of ARS scientist-probationers comprising multidisciplinary team of six members from different disciplines including Animal Physiology, Plant Pathology, Seed Technology, Electronics & Instrumentation, Agricultural Chemistry and Soil Science, had undergone twenty one days FET programme in this Nikhri village under the supervision of Regional Research Station, CCS Haryana Agricultural University, Bawal (RRS, CCSHAU, Bawal). During the period, assessment was done on the agricultural situation in the village, needs of the farmers as they felt, resources available, livelihood, technology adoption, rejection and transfer process, problems and prospects relating to agriculture and allied sectors like animal husbandry, opportunities and research strategies which need to be devised to address these issues.

METHODOLOGY

As the study was completely participatory and interdisciplinary, twenty-one tools of PRA techniques were used as given below

- Rapport building and Collection of basic information of village
- Village transect
- Agro ecosystem map
- Social map
- Resource map
- Seasonal calendar and analysis
- Gender analysis
- Time line
- Time trend
- Technology map
- Matrix Ranking
- Consequence Diagram
- Bio Resource flow
- Wealth Ranking
- Livelihood analysis
- Venn Diagram
- Mobility Map
- IndigeinousTechnical Knowledge
- Problem identification
- Problem and solution tree
- Action Plan

The following procedures were used to invoke participation and data collection.

Agro-ecosystem Mapping

The farmers identified resources and location, their utility and decision system (Hoque. 1984). They drew a map on the ground and later translate it to the drawing sheet. The farmers discussed various decision-making systems while constructing the maps, and other useful information about the village were also collected while preparing the agro ecosystem map.

Village Transect

Three transect walks through the village were conducted along with villagers and discussions during the walks helped to identify indigenous natural resource types, elements of systems (Conway 1985, Mettrick, 1993) to find contrast in various niches and reasons of contrast.

Problem Analysis

Agro ecosystem analysis helped to carry out problem analysis. The problems in the system were identified, analyzed (Mettrick. 1993) and ranked on the basis of various criteria identified by the farmers and the intensity of yield loss (Sabarathnam and Vennila, 1996). There was an in depth analysis of the topmost problem in the form of constraint-objective trees constructed after focused group discussions with key stakeholders.

RESULTS

Agro-ecology

The village 'Nikhri' lies in the block Rewari of District Rewari in Haryana bordering Rajasthan. The village is located at National Highway No. 8 (Delhi-Jaipur) near Dharuhera and Rewari. It is situated at 76°5/E longitude, 28°1/N latitude and altitude of 266m. The climate is semiarid characterized by hot summer and cold winter (arid &semi arid region). Maximum summer temperature of 45°C is recorded in the month of May. Whereas, the minimum temperature goes down to 2°C in the month of January. Annual rainfall is around 500 mm. The soil type is loamy sand. Figure 1 shows the agro-ecology map of the village.

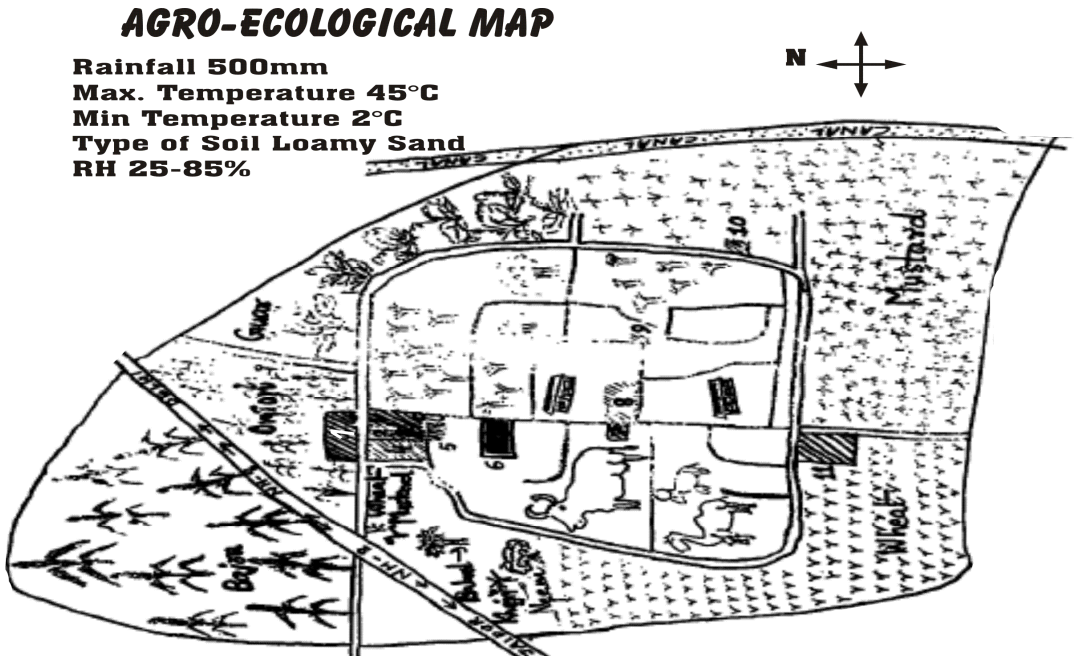

Figure1: Agro ecological Map of the Village Nikhri

Land Utilization Pattern

Total land area of this village is 275 ha out of which 263 ha is net cultivable, 68.2% of this is Net Sown Area (NSA). Irrigation is well developed in the village and the main sources of irrigation are tube wells and rain water. The soil type is loamy sand. The land pattern per household varies from 2-40 acres with an average of 5 acre per household. Motor operated tube wells are 40 and diesel engine operated tube wells are 15 in number. There is also a small pond in the village.

Crop Production System

The crops mainly grown are wheat, jowar, mustard, bajra, raya, guar, mung, barley &chikori (kashni). Vegetable crops include brinjal, chilies, tomato, onion, okra and bottle gourd etc. Tree plants like neem, jant, kikarpipal, siris and babool are mostly found in and around the village. Crops are infested with pest and diseases and weeds. Farming is done with all the latest implements like tractor, disk harrow, thresher and sprayers.

In kharif season jowar, guar &bajra are the major crops. Some popular varieties are HHB67, HHB117, HHB94 in bajra; HG365 in guar. In rabi season the important crops are wheat, mustard. Some popular varieties are WH283, WH47, WH343, WH711, WH416 in wheat; T59, RS30, PUSA BOLD in mustard. Farmers are also growing amla, guava and ber. Table I gives the average yield in kg/acre in case of some crops.

Table I: Yield of Some Crops

Crop	Yield (kg/acre)
Wheat	2400
Mustard	1000
Bajra	1200
Guar	600

The Cropping Intensity (C.I) of the village is 200 %. Farmers have their own criteria and prefer some crops over others. As per their preference, farmers left the cultivation of cotton, red gram. They grow Amla as suggested by scientist of RRS, Bawal. Cropping system is also not free of problems. The most serious problems of crop production are termites, pests and weeds. The problems are higher cost of seeds, spurious seeds and fungal infection of seeds. Farmers are well aware of improved varieties and are adopting latest technologies. Labour availability is adequate throughout the year but during sowing and harvesting the labour is available from the border areas of adjoining state of Rajasthan. Farming is done with all the latest implements like tractor, disk harrow, thresher and sprayers. Irrigation is done with the tube well / bore well using the Diesel engine and the electric motor pump

Livestock Production System

The livestock population of the village consists of buffaloes, cattle, goats, sheep, camel and poultry. Buffaloes are preferred over the cattle. Population and average yield is as shown in Table II.

Table 2: Population and average Milk Yield

Type of Animal	Population	Economic yield (Kg/ Day)
Cattle	28(Jersey 12)	8 – 9 (kg/ Day)
Buffalo	903	10-15 (kg/ Day)
Goat	103	1-1.5 (kg/ Day)
Sheep	197	0.2-0.5 (kg/ Day)
Camel	4	---

The main breed of the buffaloes is *Murrah* and for cattle is *Desi*. The villagers have adopted the practice of artificial insemination. Villagers sell the milk to the cooperative society, which has the centre in the village itself. Dung is used for organic farming and fuel.

Village Transect

The village depicts plain topography, variations occur at a minor level which are associated with specific features with respective characteristics (see village transect in Table III). Upland has trees like babool, neem, Kikar, Jant, Pipal, Siris and it is a major crop production center. Low Land is mainly used for residential purpose.

Table 3: Village Transect

Particular	Zone1	Zone2
Topography	Upland	Low Land
Crop	Wheat, Jowar, Mustard, Bajra, Guar, Raya, Mung, Barley &Chikori (Kashni).	Kitchen Garden
Horticulture Crops	• Tomato, Chilly, Okra, Onion, Brinjal, • Marigold • Ber, Amla, Guava	Okra, Brinjal
Livestock	--	Cattle, Buffalo, Goat, Sheep, Camel, Poultry
Soil Type	Loamy sand	Loamy sand
Water Resources	Tube Well, rainwater	Tube Well
Tree	Babool	Neem, Jant, KikarPipal, Siris, Babool
Fodder Crop	Chikori (Kashni), Jowar, Bajra	-
Problems	Water shortage, Pests, diseases,	Low Milk Yield
Opportunities	Termite Control, Horticulture crops, seed quality, Improvement in Milk Yield, Multi storied cropping, crop rotation and diversification	Kitchen Garden

Living Standard

The literacy rate of the village is more than 90 % and is having a high school and easily accessible to the school and colleges, which are easily accessible to nearby areas. Most of the villagers do other jobs apart from agriculture. There are judges, lawyers, doctors, engineers, bank employees, government employees and teachers. One of the villagers is employed as professor in the RRS, CCSHAU Bawal. Also RRS Bawal has influence on the agricultural system. The village is well approachable by the state agricultural officers. Thus it can be said that the village is progressive with good standard of living.

Problem Analysis

While analyzing the system properties, following researchable and non-researchable problems were identified, the problem ranked in order of their impact

- Termites problem
- Mustard aphid
- Leaf Curl

- Soil salinity
- White rust of raya
- Brown rust of wheat
- Foot and mouth disease in cattle & buffalo
- Milk fever

However, farmers are using very less pesticides in crops, so controlling is difficult. There were two major problems related to animal husbandry evaluated using matrix rank analysis.

DISCUSSIONS

A participatory in-depth study through various constraint and analysis of the top most researchable problem revealed various reasons contributing to the problem and find out probable research themes (see problem and solution tree in Figure 2).

Under this PRA tool, all the problems were discussed with the farmers for all possible reasons using top down approach. It is short dandogram based analysis of the problem by the farmers. The possible solution for each cause was also discussed with the farmers. These causes and solutions were discussed and revised with the subject matter specialist

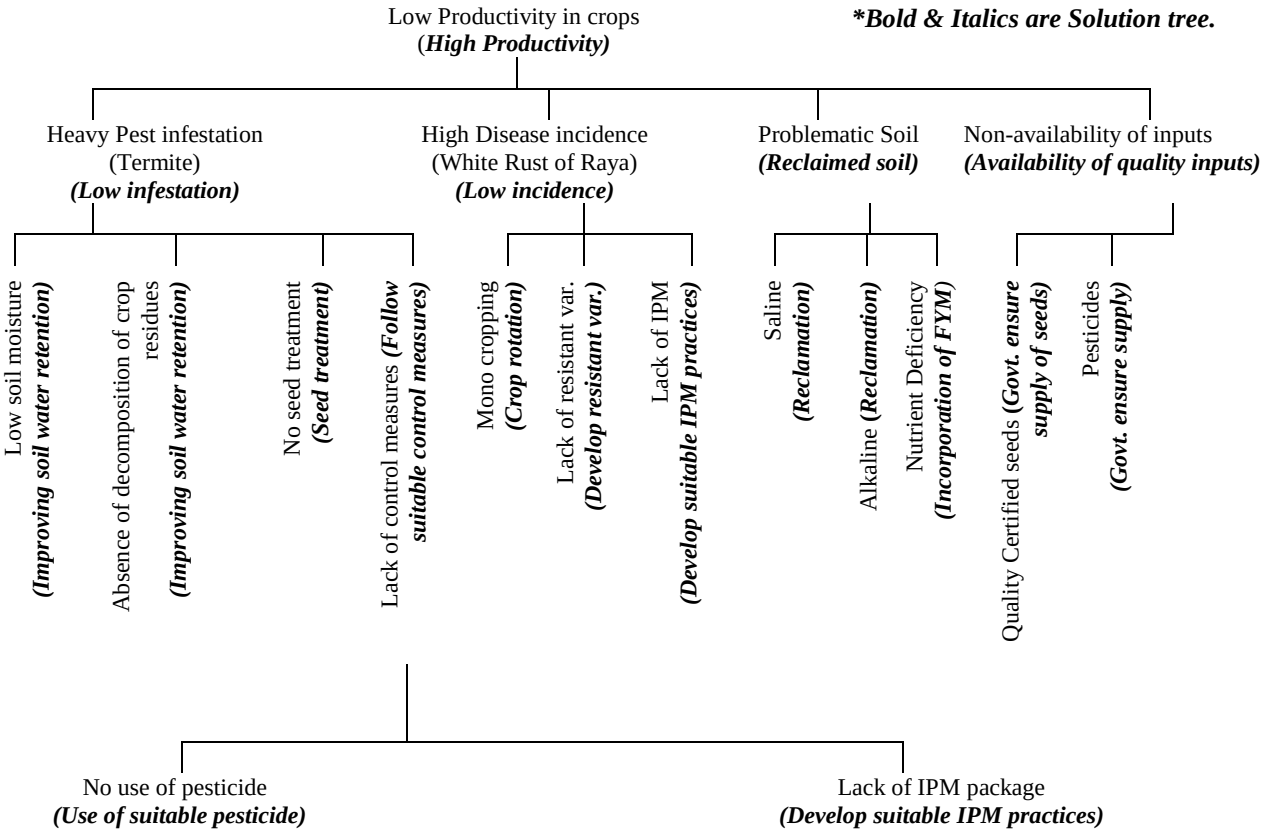

Figure 2: Problem & Solution Tree

before finalization of the tree.

The problem and solution tree was prepared for the problem of **Termites Problem in crops** as it ranked first based on rank based quotient (RBQ) and value-based index (VBI). The key informants, those who were facing this

problem, were discussed with. First, the causes/ reasons for the problem were asked in detailed as per their perception and experience. Then the possible solution(s) for each cause was discussed.

Termite (*Odontotermes*sp; *Microtermes* sp.) is a major pest of semiarid region causing huge losses to almost all crops of this region. It survives in soil throughout its life cycle. In the Nikhri village, termite is a major problem causing 30-40% loss in wheat, mustard, bajra, jowar and guar. Control of this pest is not so easy as it resides in soil. There is very few integrated pest management package for the control of this pest. Farmers hardly use synthetic pesticides for the protection of crops. Seed treatment for the control of termite is hardly done by the farmers. So, the causes and solutions were discussed and finalized after discussion with key informants and subject matter specialist at local center to control the menace.

Among the different aspects of solutions for the control of termite, development of IPM package and management of soil moisture are the two key probable solutions.

CONCLUSIONS

The importance of PRA as an analytical tool and as a training tool was realized positively. The information collected in the village is in agreement with various other studies conducted in the past, the study also provided issues of disagreement with earlier studies. The PRA tools helped to make in depth participatory analysis for bringing out new emerging issues for conducting further research and make recommendations. The interdisciplinary team of scientists for FET has suggested the following action plan entitled 'Productivity enhancement through pest management in Nikhri village: An Integrated Approach'

The objectives for the action plans have been outlined as follows.

- To develop eco friendly pesticides for controlling termites. (Agri. Chemistry).
- To develop suitable bio-pesticides for controlling termites. (Plant Pathology).
- To evaluate the performance of developed pesticide on seed viability. (Seed Technology)
- To evaluate the impact of soil moisture on termite infestation in field conditions. (Soil Science)
- To assess the impact of termite infestation on fodder quality in terms of milk yield. (Animal Science)
- To develop farmers friendly /simple moisture sensor for forecasting termite infestation. (Electronic and instrumentation).

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